National Aeronautics and Space Administration

NASA'S TECHNOLOGY INFUSION
ROAD TOUR
Historically Black Colleges/Universities & Minority Serving Institutions
NEW MEXICO STATE UNIVERSITY

Earth Observation for Terrestrial Ecology

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Office of Small Business Mentor-Protégé Program

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EO for Terrestrial Ecology

Research focus

Savanna Lab
@ New Mexico State University

- Using unique combinations of satellite data to map woody cover and biomass (optical, radar, lidar)
- Using machine learning to predict woody biomass under future climate scenarios, population growth and fire regimes
- Providing publicly available Google Earth Engine applications that map changing rangeland resources through time
- Using advanced geospatial analysis to better understand the stability of savanna (tree-grass) ecosystem states
- Using very high resolution (VHR) satellite, aircraft and drone data and object recognition to map shrub cover in southwestern rangelands and study shrub encroachment processes
- Modelling short and long term carbon, water and energy fluxes

EO for Terrestrial Ecology
Facilities

- Computer hardware and software for processing and analysis of large geospatial data sets
- Pixel- and object-based classification
- Machine learning and advanced geospatial analysis
- Field based remote sensing capabilities: UAV's with RGB camera and multi-band radiometer capabilities, terrestrial LIDAR, leaf area index

ZEB-1 Terrestrial Laser Scanner

3-D point-cloud to derive canopy cover, wood volume, leaf area

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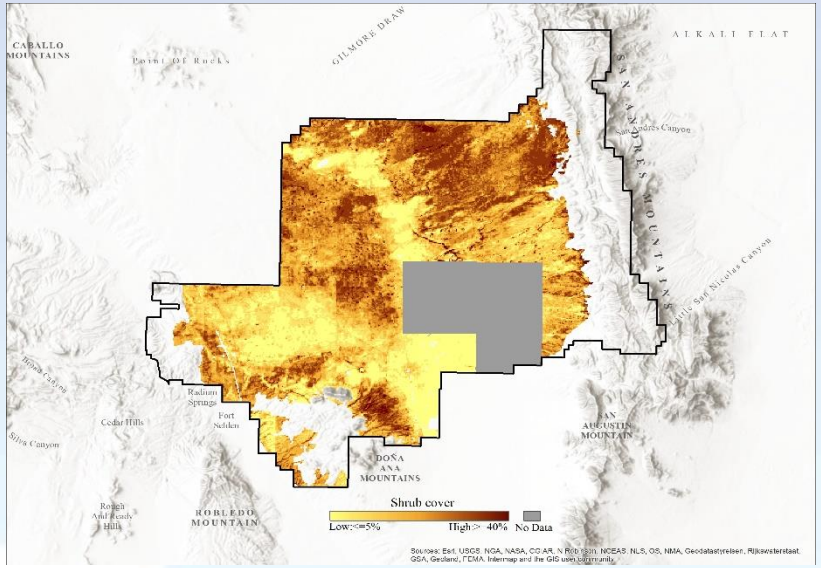
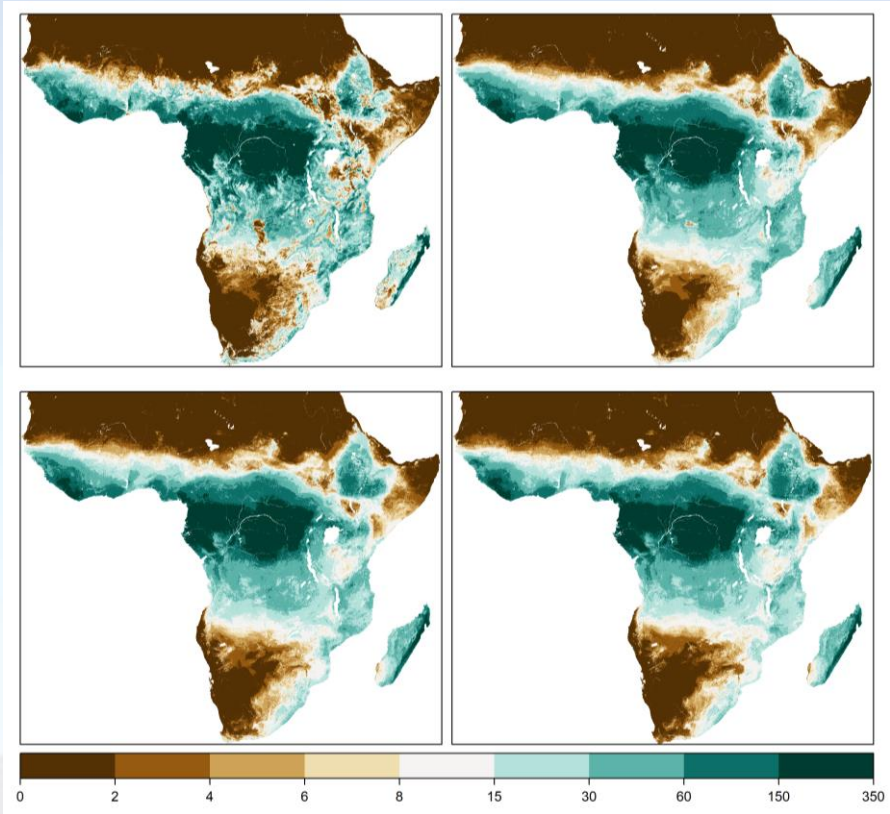
Multi-scale remote sensing, object recognition, machine learning



Map of percent shrub cover at the Jornada Range and College Ranch in 2011 derived from airborne 1-m resolution imagery. *W. Ji*



Woody Biomass in Africa

(a) Satellite derived current woody biomass estimates (Mg/ha)

(b) Machine learning predicted current woody biomass

(c) Future woody biomass under RCP 4.5 climate with population growth

(d) Future woody biomass under RCP 8.5 climate with population growth

C. W. Ross

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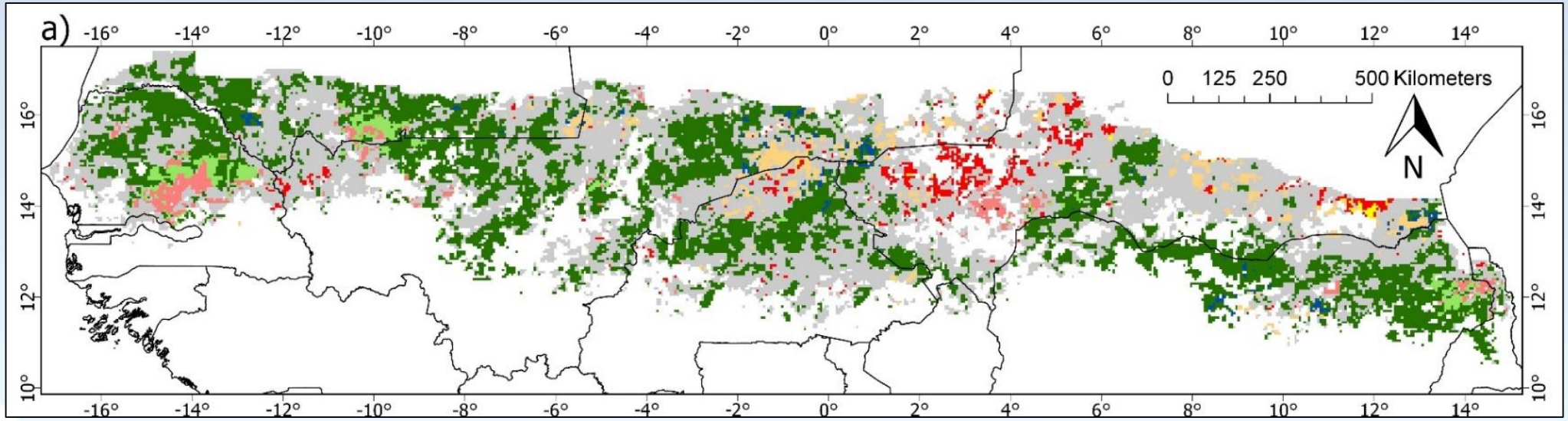
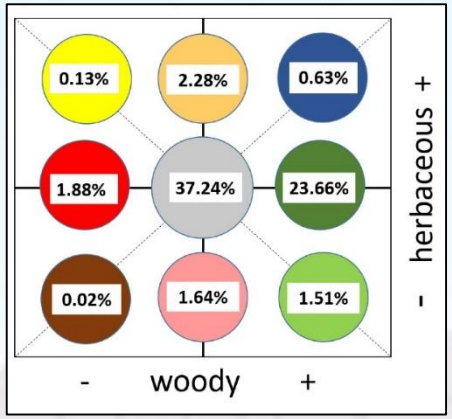
Multi-temporal remote sensing





Map of woody and herbaceous vegetation change between 1982-1991 and 2004-2013 in the West African Sahel.

J. Anchang

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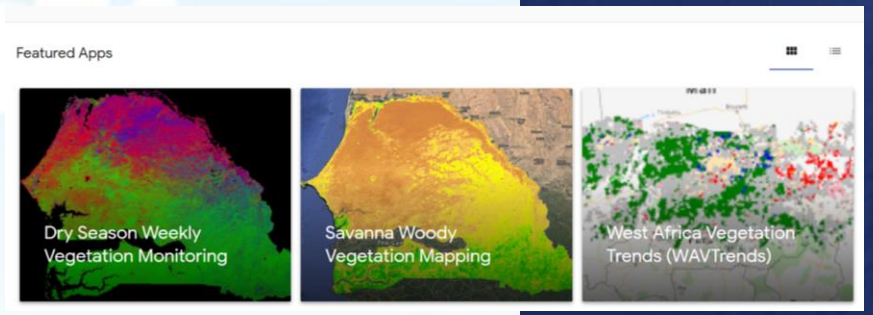
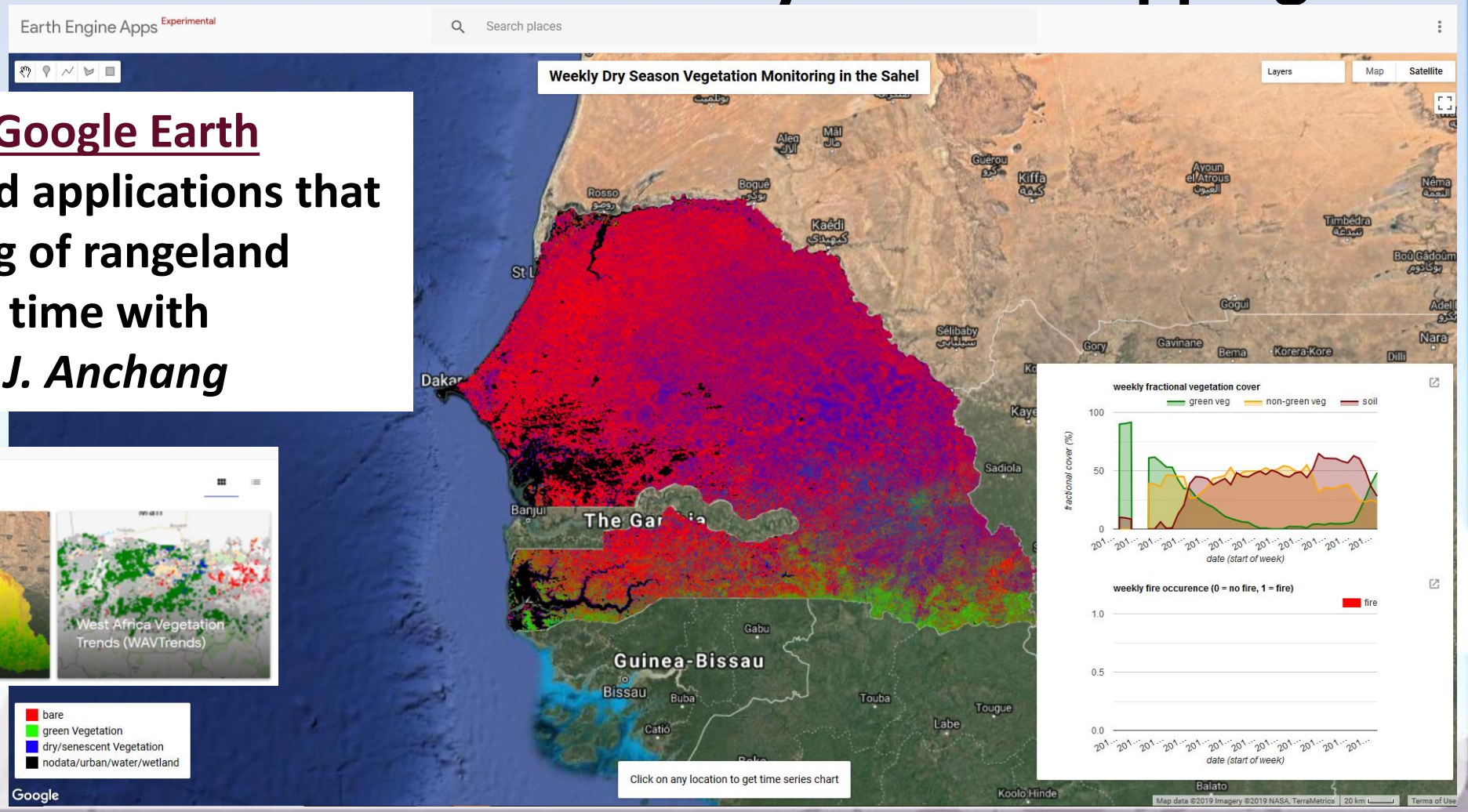
Cloud based analysis and mapping

Publicly available Google Earth Engine cloud based applications that automate mapping of rangeland resources through time with machine learning. *J. Anchang*





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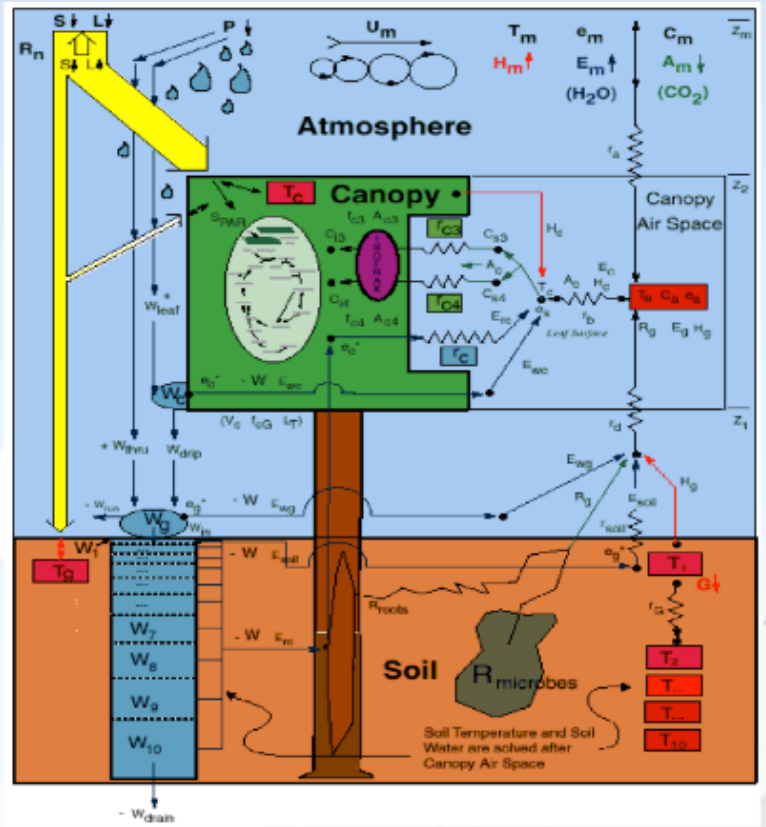
Modelling

Ecosystem - Atmosphere

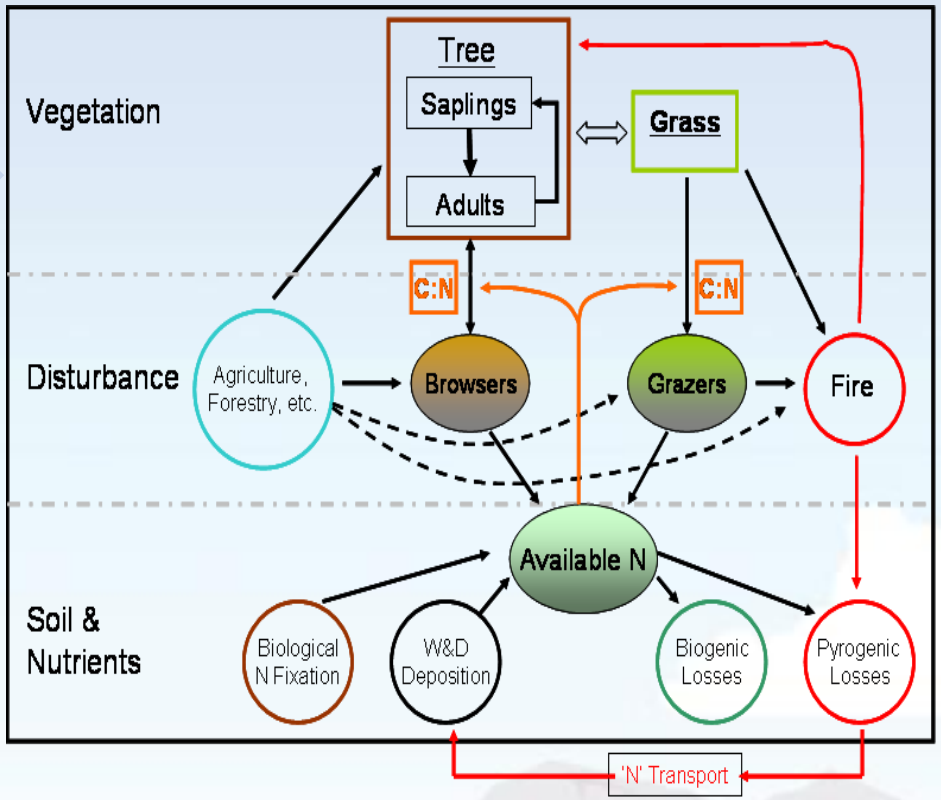


SiB: Simple Biosphere Model
Sellers et al 1986, 1996a

- Long-term carbon source/sink processes
- Annual and monthly time step

- Short term carbon, water and energy fluxes
- Seconds to hours time step
- Parameterized with satellite imagery

Dynamic Vegetation



TGVM: Tree Grass Vegetation Model

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Lab Members

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